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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Applicant: Sanjeev Aggarwal, et al.

Docket Number: TI-34784.1

Serial No.: 10/679,144

Art Unit: 2812

Filed: 10/03/03

Examiner: Jennifer M. Kennedy

For: Method of Making a Haze Free PZT Film

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NAME OF INVENTOR(S): Sanjeev Aggarwal, et al.	
TITLE OF INVENTION: Method of Making a Haze Free PZT Film	
TI FILE NO.: TI-34784.1	DEPOSIT ACCT. NO.: 20-0668
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Applicant: Sanjeev Aggarwal, et al.

Art Unit: 2812

Serial No.: 10/679,144

Examiner: Jennifer M. Kennedy

Filed: 10/03/03

Docket: TI-34784.1

For: METHOD OF MAKING A HAZE FREE PZT FILM

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450


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Karen Vertz
Karen Vertz

12-14-05
Date

Transmitted herewith is an Appeal Brief in the above-identified application. The Commissioner is hereby authorized to charge the **\$500.00** fee for this appeal, or credit any overpayment to Account No. 20-0668. A duplicate copy of this sheet is enclosed.

Respectfully submitted,


Rose Alyssa Keagy
Registration No. 35,095

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Patent Department
Dallas, Texas 7526512/15/2005 TL0111 00000027 200668 10679144
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: Aggarwal et al.

Docket No.: TI-34784.1

Serial No.: 10/679,144

Art Unit: 2812

Filed: 10/03/2003

Examiner: Kennedy, J. M.

Confirmation No.:3634

Title: Method of Making a Haze Free PZT Film

APPEAL BRIEF UNDER 37 CFR §1.192

December 14, 2005

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
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Karen Vertz
Karen Vertz

12-14-05
Date

Pursuant to the final Office Action mailed 07/27/2005, the Appellants submit this Appellants' Brief. The Commissioner is hereby requested and authorized to charge any fees necessary for the filing of the enclosed papers to the deposit account of Texas Instruments Incorporated, Account No. 20-0668.

TABLE OF CONTENTS

Item	Page
Identification Page	1
Table of Contents	2
Real Party in Interest	3
Related Appeals and Interferences	4
Status of Claims	5
Status of Amendments	6
Summary of Claimed Subject Matter	7
Grounds of Rejection to Be Reviewed On Appeal	12
Argument	14
Conclusion	57
Claims Appendix	58
Evidence Appendix	62
Related Proceedings Appendix	63

REAL PARTY IN INTEREST

The Real Party in Interest in the present appeal is Texas Instruments Incorporated, the assignee, as evidenced by the assignment carried from the original application and set forth at Reel 014019, Frame 0004.

RELATED APPEALS AND INTERFERENCES

The parent case is currently under appeal and its status is "Appeal Awaiting BPAI Docketing" in Private PAIR. The application number of the parent case is 10/356,114 and it was filed 01-30-2003. The appeal number is unknown. Jennifer M. Kennedy is the Examiner for the parent and for this application.

STATUS OF CLAIMS

Claims 74-76 and 80-97 are the subject of this appeal. Claims 74-76 and 80-97 are pending and rejected

STATUS OF AMENDMENTS

The Appellants did not file any amendment subsequent to the final Office Action dated July 27, 2005.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent Claim 74 is directed to a method (FIG. 2, page 3 line 24 through page 7 line 18) of forming a haze free PZT film (element 3 of FIG. 3, page 3 lines 15-19). The method includes forming a front-end structure over a semiconductor substrate (step 202 of FIG. 2, page 3 lines 23-24, page 2 lines 16-17) and forming a bottom electrode over the front-end structure (step 206 of FIG. 2, page 4 lines 6-12). The method also includes preheating the semiconductor wafer (step 208 of FIG. 2, page 4 line 14 through page 5 line 7) and forming a PZT film over the bottom electrode (step 210 of FIG. 2, page 5 lines 9-20). The preheating step comprises placing the semiconductor wafer on a heater (element 11 of FIG. 4, page 4 line 24) and heating the semiconductor wafer (element 2 of FIG. 4) in an ambient comprised of a mixture of an inert gas and an oxidizer gas (page 5 lines 1-7).

Independent Claim 75 is directed to a method (FIG. 2, page 3 line 24 through page 7 line 18) of forming a haze free PZT film (element 3 of FIG. 3, page 3 lines 15-19). The method includes forming a front-end structure over a semiconductor substrate (step 202 of FIG. 2, page 3 lines 23-24, page 2 lines 16-17) and forming a bottom electrode over the front-end structure (step 206 of FIG. 2, page 4 lines 6-12). The method also includes preheating the semiconductor wafer (step 208 of FIG. 2, page 4 line 14 through page 5 line 7) and forming a PZT film over the bottom electrode (step 210 of FIG. 2, page 5 lines 9-20). The preheating step comprises placing the

semiconductor wafer on a heater (element 11 of FIG. 4, page 4 line 24) and heating the semiconductor wafer (element 2 of FIG. 4) in an inert gas (page 5 lines 1-2).

Independent Claim 76 is directed to a method (FIG. 2, page 3 line 24 through page 7 line 18) of forming a haze free PZT film (element 3 of FIG. 3, page 3 lines 15-19). The method includes forming a front-end structure (step 202 of FIG. 2, page 3 lines 23-24, page 2 lines 16-17) and forming a bottom electrode over the front-end structure (step 206 of FIG. 2, page 4 lines 6-12). The method also includes preheating the semiconductor wafer (step 208 of FIG. 2, page 4 line 14 through page 5 line 7) and forming a PZT film over the bottom electrode (step 210 of FIG. 2, page 5 lines 9-20). The preheating step comprises placing the semiconductor wafer on a heater (element 11 of FIG. 4, page 4 line 24) and heating the semiconductor wafer (element 2 of FIG. 4) in a vacuum (page 5 lines 6-7).

Claim 80 is dependent on Claim 74 and further specifies that the inert gas is Ar (page 5 lines 2-5).

Claim 81 is dependent on Claim 74 and further specifies that the inert gas is N₂ (page 5 line 5).

Claim 82 is dependent on Claim 74 and further specifies that the oxidizer gas is O₂ (page 5 line 3).

Claim 83 is dependent on Claim 80 and further specifies that Ar comprises at least 20% of the flow of the inert/oxidizer gas mixture (page 5 lines 3-4).

Claim 84 is dependent on Claim 74 and further specifies that the PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$ (page 5 lines 17-19).

Claim 85 is dependent on Claim 74 and further specifies that the PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 (page 5 lines 10-12).

Claim 86 is dependent on Claim 74 and further specifies that the PZT film is doped up to 5% with either La or Nb (original Claim 86).

Claim 87 is dependent on Claim 75 and further specifies that the inert gas is Ar (page 5 lines 2-5).

Claim 88 is dependent on Claim 75 and further specifies that the inert gas is N_2 (page 5 line 5).

Claim 89 is dependent on Claim 75 and further specifies that the inert gas is He (page 5 line 5).

Claim 90 is dependent on Claim 75 and further specifies that the PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$ (page 5 lines 17-19).

Claim 91 is dependent on Claim 75 and further specifies that the PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 (page 5 lines 10-12).

Claim 92 is dependent on Claim 75 and further specifies that the PZT film is doped up to 5% with either La or Nb (original Claim 92).

Claim 93 is dependent on Claim 75 and further specifies that the PZT film is PbZrO_3 (original Claim 93).

Claim 94 is dependent on Claim 76 and further specifies that the PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$ (page 5 lines 17-19).

Claim 95 is dependent on Claim 76 and further specifies that the PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 (page 5 lines 10-12).

Claim 96 is dependent on Claim 76 and further specifies that the PZT film is doped up to 5% with either La or Nb (original Claim 96).

Claim 97 is dependent on Claim 76 and further specifies that the PZT film is PbZrO_3 (original Claim 97).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 74-76, 80-85, 87-91, 93-95, and 97 stand rejected under 35 U.S.C. §102(e) as anticipated by the patent granted to Basceri et al. (U.S. Pat. No. 6,444,478).

2. Claims 74-75, 80-82, 84-85, 87-91 and 93 stand rejected under 35 U.S.C. §102(e) as anticipated by the patent granted to Gilbert et al. (U.S. Pat. No. 6,730,354).

3. Claims 86, 92, and 96 stand rejected under 35 U.S.C. §103(a) as unpatentable over the patent granted to Basceri et al. (U.S. Pat. No. 6,444,478).

4. Claim 83 stands rejected under 35 U.S.C. §103(a) as unpatentable over the patent granted to Gilbert et al. (U.S. Pat. No. 6,730,354).

5. Claims 86 and 92 stand rejected under 35 U.S.C. §103(a) as unpatentable over the patent granted to Gilbert et al. (U.S. Pat. No. 6,730,354) in view of Sakurai (U.S. Pat. No. 6,350,644).

6. Claims 76 and 95-97 stand rejected under 35 U.S.C. §103(a) as unpatentable over the patent granted to Sakurai (U.S. Pat. No. 6,350,644) in view of Isobe et al. (U.S. Pat. No. 6,114,199).

7. Claim 94 stands rejected under 35 U.S.C. §103(a) as unpatentable over the patents granted to Sakurai (U.S. Pat. No. 6,350,644) and Isobe et al. (U.S. Pat. No. 6,114,199) in view of Gilbert et al. (U.S. Pat. No. 6,730,354).

ARGUMENT

Rejection under 35 U.S.C. §102(e) over the patent granted to Basceri et al. (U.S. Pat. No. 6,444,478).

Claim 74

Independent Claim 74 positively recites that the preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an ambient comprised of a mixture of an inert gas and an oxidizer gas. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the statement in the Office Action (page 2) that Basceri et al. teaches a preheat step in "column 7, lines 10 through column 8, lines 55". Rather, in column 7 line 10 through column 8 line 55, Basceri et al teaches a film deposition process that does not include a preheat step (column 7 lines 12-13 and 64-65, column 8 lines 23-25). The Appellants note that the use of a precursor (e.g. Basceri et al.) is not the same as the use of gases during a preheat step (e.g. the Appellants advantageously claimed invention). Moreover, the film produced by the method taught by Basceri et al. is not haze free as advantageously claimed.

Therefore, Claim 74 is patentable over the patent granted to Basceri et al.

Claim 75

Independent Claim 75 positively recites that the preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an inert gas. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the statement in the Office Action (page 2) that Basceri et al. teaches a preheat step in "column 7, lines 10 through column 8, lines 55". Rather, in column 7 line 10 through column 8 line 55, Basceri et al teaches a film deposition process that does not include a preheat step (column 7 lines 12-13 and 64-65, column 8 lines 23-25). The Appellants note that the use of a precursor (e.g. Basceri et al.) is not the same as the use of gases during a preheat step (e.g. the Appellants advantageously claimed invention). Moreover, the film produced by the method taught by Basceri et al. is not haze free as advantageously claimed.

Therefore, Claim 75 is patentable over the patent granted to Basceri et al.

Claim 76

Independent Claim 76 positively recites that the preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in a vacuum. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the statement in the Office Action (page 2) that Basceri et al. teaches a preheat step in "column 9, lines 15-25". Rather, in column 9 lines 15-25 Basceri et al teaches a deposition process but not a preheat step (column 9 lines 17-18). Moreover, the film produced by the method taught by Basceri et al. is not haze free as advantageously claimed.

Therefore, Claim 76 is patentable over the patent granted to Basceri et al.

Claim 80

Dependent Claim 80 positively recites that the inert gas is Ar in the preheat step of Claim 74. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 8 lines 43-55 and column 9 lines 25-47. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 8 lines 23-25, column 9 lines 25-27).

Therefore, Claim 80 is patentable over the patent granted to Basceri et al.

Claim 81

Dependent Claim 81 positively recites that the inert gas is N₂ in the preheat step of Claim 74. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 8 lines 43-55 and column 9 lines 25-47. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 8 lines 23-25, column 9 lines 25-27).

Therefore, Claim 81 is patentable over the patent granted to Basceri et al.

Claim 82

Dependent Claim 82 positively recites that the oxidizer gas is O₂ in the preheat step of Claim 74. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 8 lines 43-55 and column 9 lines 25-47. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 8 lines 23-25, column 9 lines 25-27).

Therefore, Claim 82 is patentable over the patent granted to Basceri et al.

Claim 83

Claim 83 is dependent on Claim 80 and is therefore allowable for the same reasons that Claims 74 and 80 are allowable. Furthermore, Claim 83 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claims 74 and 80, are not taught nor suggested by the patent granted to

Basceri et al. Namely, Claim 83 further specifies the additional limitation that Ar comprises at least 20% of the flow of said inert/oxidizer gas mixture in the preheat step.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67).

Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed inert/oxidizer gas mixture. The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 6 line 44 through column 7 line 5. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 6 lines 51-57).

Therefore, Claim 83 is patentable over the patent granted to Basceri et al.

Claim 84

Claim 84 is dependent on Claim 74 and is therefore allowable for the same reasons that Claim 74 is allowable. Furthermore, Claim 84 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 74, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 84 further specifies the additional limitation that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 74 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film (containing at least 2% excess Pb).

Therefore, Claim 84 is patentable over the patent granted to Basceri et al.

Claim 85

Claim 85 is dependent on Claim 74 and is therefore allowable for the same reasons that Claim 74 is allowable. Furthermore, Claim 85 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 74, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 85 further specifies the additional limitation that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 74 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is a solid solution of the component end members

PbZrO₃ and PbTiO₃. Moreover, the Appellants submit that it is improper for the teachings of Gilbert et al. to be cited in a rejection of Claim 85 over Basceri et al. under 35 U.S.C. §102(e) (see Office Action, page 3).

Therefore, Claim 85 is patentable over the patent granted to Basceri et al.

Claim 87

Dependent Claim 87 positively recites that the inert gas is Ar in the preheat step of Claim 75. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 8 lines 43-55 and column 9 lines 25-47. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 8 lines 23-25, column 9 lines 25-27).

Therefore, Claim 87 is patentable over the patent granted to Basceri et al.

Claim 88

Dependent Claim 88 positively recites that the inert gas is N₂ in the preheat step of Claim 75. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67). The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 8 lines 43-55 and column 9 lines 25-47. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 8 lines 23-25, column 9 lines 25-27).

Therefore, Claim 88 is patentable over the patent granted to Basceri et al.

Claim 89

Dependent Claim 89 positively recites that the inert gas is He in the preheat step of Claim 75. These advantageously claimed features are not taught or suggested by the patent granted to Basceri et al.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of a preheat step (column 7 lines 56-59 and 64-67).

The Appellants respectfully traverse the implication in the Office Action (page 3) that Basceri et al. teaches a preheat step in column 8 lines 43-55 and column 9 lines 25-47. Rather, Basceri et al teaches a film deposition process that does not include a preheat step (column 8 lines 23-25, column 9 lines 25-27).

Therefore, Claim 89 is patentable over the patent granted to Basceri et al.

Claim 90

Claim 90 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 90 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 90 further specifies the additional limitation that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 75 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film (containing at least 2% excess Pb).

Therefore, Claim 90 is patentable over the patent granted to Basceri et al.

Claim 91

Claim 91 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 91 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 91 further specifies the additional limitation that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 75 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is a solid solution of the component end members PbZrO_3 and PbTiO_3 . Moreover, the Appellants submit that it is improper for the teachings of Gilbert et al. to be cited in a rejection of Claim 91 over Basceri et al. under 35 U.S.C. §102(e) (see Office Action, page 3).

Therefore, Claim 91 is patentable over the patent granted to Basceri et al.

Claim 93

Claim 93 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 93 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 93 further specifies the additional limitation that the haze free PZT film is PbZrO_3 .

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 75 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is PbZrO_3 . Moreover, the Appellants submit that it is improper for the teachings of Gilbert et al. to be cited in a rejection of Claim 93 over Basceri et al. under 35 U.S.C. §102(e) (see Office Action, page 3).

Therefore, Claim 93 is patentable over the patent granted to Basceri et al.

Claim 94

Claim 94 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 94 is allowable on its own merits

because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 94 further specifies the additional limitation that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 75 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film (containing at least 2% excess Pb).

Therefore, Claim 94 is patentable over the patent granted to Basceri et al.

Claim 95

Claim 95 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 95 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 95 further specifies the additional limitation that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 76 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is a solid solution of the component end members PbZrO_3 and PbTiO_3 . Moreover, the Appellants submit that it is improper for the teachings of Gilbert et al. to be cited in a rejection of Claim 95 over Basceri et al. under 35 U.S.C. §102(e) (see Office Action, page 3).

Therefore, Claim 95 is patentable over the patent granted to Basceri et al.

Claim 97

Claim 97 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 97 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 97 further specifies the additional limitation that the haze free PZT film is PbZrO_3 .

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 76 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri

et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is PbZrO_3 . Moreover, the Appellants submit that it is improper for the teachings of Gilbert et al. to be cited in a rejection of Claim 97 over Basceri et al. under 35 U.S.C. §102(e) (see Office Action, page 3).

Therefore, Claim 97 is patentable over the patent granted to Basceri et al.

Rejection under 35 U.S.C. §102(e) over the patent granted to Gilbert et al. (U.S. Pat. No. 6,730,354).

Claim 74

Independent Claim 74 positively recites that the preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an ambient comprised of a mixture of an inert gas and an oxidizer gas. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the formation of a haze free PZT film (column 8 lines 7-9). In addition, Gilbert et al. teaches away from the claimed invention because Gilbert et al. requires that the wafer be suspended by lift pins over "susceptor 24" (column 6 lines 55-

63, see also column 7 lines 3-4); but not on the heater as advantageously claimed. Moreover, Gilbert et al. teaches away from the claimed invention because Gilbert et al. states that placing a substrate immediately into contact with the susceptor is problematic (column 6 lines 63-67, see also column 7 lines 3-4).

The Appellants respectfully traverse the statement in the Office Action (page 4) that Gilbert et al. teaches the advantageously claimed preheat step in column 6 line 54 through column 7 line 13 and in column 3 lines 13-55. The Appellants submit that in column 6 line 54 through column 7 line 13 that Gilbert et al teaches a preheat step with no gases present (column 6 lines 54-55, column 7 lines 14-15). Furthermore, in column 3 lines 13-55 Gilbert et al teaches the use of an oxidizing co-reactant gas and a purge gas during PZT deposition but not during a preheat step.

Therefore, Claim 74 is patentable over the patent granted to Gilbert et al.

Claim 75

Independent Claim 75 positively recites that the preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an inert gas. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the formation of a haze free PZT film (column 8 lines 7-9). In addition, Gilbert et al. teaches away from the claimed invention because Gilbert et al. requires that the wafer be suspended by lift pins over "susceptor 24" (column 6 lines 55-63, see also column 7 lines 3-4); but not on the heater as advantageously claimed. Furthermore, Gilbert et al. teaches away from the claimed invention because Gilbert et al. states that placing a substrate immediately into contact with the susceptor is problematic (column 6 lines 63-67, see also column 7 lines 3-4).

The Appellants respectfully traverse the statement in the Office Action (page 4) that Gilbert et al. teaches the advantageously claimed preheat step in column 6 line 54 through column 7 line 13 and in column 3 lines 13-55. The Appellants submit that in column 6 line 54 through column 7 line 13 that Gilbert et al teaches a preheat step with no gases present (column 6 lines 54-55, column 7 lines 14-15). Furthermore, in column 3 lines 13-55 Gilbert et al teaches the use of an oxidizing co-reactant gas and a purge gas during PZT deposition but not during a preheat step.

Therefore, Claim 75 is patentable over the patent granted to Gilbert et al.

Claim 80

Dependent Claim 80 positively recites that the inert gas is Ar in the preheat step of Claim 74. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of Ar in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 4) that Gilbert et al. teaches the use of Ar in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Therefore, Claim 80 is patentable over the patent granted to Gilbert et al.

Claim 81

Dependent Claim 81 positively recites that the inert gas is N₂ in the preheat step of Claim 74. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of N₂ in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 4) that Gilbert et

al. teaches the use of N₂ in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Therefore, Claim 81 is patentable over the patent granted to Gilbert et al.

Claim 82

Dependent Claim 82 positively recites that the oxidizer gas is O₂ in the preheat step of Claim 74. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of O₂ in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 4) that Gilbert et al. teaches the use of O₂ in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Therefore, Claim 82 is patentable over the patent granted to Gilbert et al.

Claim 84

Claim 84 is dependent on Claim 74 and is therefore allowable for the same reasons that Claim 74 is allowable. Furthermore, Claim 84 is allowable on its own merits

because it recites additional features of the invention that, in combination with the limitations of Claim 74, are not taught nor suggested by the patent granted to Gilbert et al. Namely, Claim 84 further specifies the additional limitation that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 74 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9).

Therefore, Claim 84 is patentable over the patent granted to Gilbert et al.

Claim 85

Claim 85 is dependent on Claim 74 and is therefore allowable for the same reasons that Claim 74 is allowable. Furthermore, Claim 85 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 74, are not taught nor suggested by the patent granted to Gilbert et al. Namely, Claim 85 further specifies the additional limitation that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 74 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9) that is a solid solution of the component end members PbZrO_3 and PbTiO_3 (column 5 lines 46-53).

Therefore, Claim 85 is patentable over the patent granted to Gilbert et al.

Claim 87

Dependent Claim 87 positively recites that the inert gas is Ar in the preheat step of Claim 75. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of Ar in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 4) that Gilbert et al. teaches the use of Ar in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Therefore, Claim 87 is patentable over the patent granted to Gilbert et al.

Claim 88

Dependent Claim 88 positively recites that the inert gas is N₂ in the preheat step of Claim 75. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of N₂ in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 4) that Gilbert et al. teaches the use of N₂ in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Therefore, Claim 88 is patentable over the patent granted to Gilbert et al.

Claim 89

Dependent Claim 89 positively recites that the inert gas is He in the preheat step of Claim 75. These advantageously claimed features are not taught or suggested by the patent granted to Gilbert et al.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of He in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 4) that Gilbert et

35 of 63 TI-34784.1

al. teaches the use of He in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Therefore, Claim 89 is patentable over the patent granted to Gilbert et al.

Claim 90

Claim 90 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 90 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Gilbert et al. Namely, Claim 90 further specifies the additional limitation that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 75 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9).

Therefore, Claim 90 is patentable over the patent granted to Gilbert et al.

Claim 91

Claim 91 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 91 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Gilbert et al. Namely, Claim 91 further specifies the additional limitation that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 75 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9) that is a solid solution of the component end members PbZrO_3 and PbTiO_3 (column 5 lines 46-53).

Therefore, Claim 91 is patentable over the patent granted to Gilbert et al.

Claim 93

Claim 93 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 93 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Gilbert et

al. Namely, Claim 93 further specifies the additional limitation that the haze free PZT film is PbZrO_3 .

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 75 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9) that is PbZrO_3 (column 9 lines 1-46).

Therefore, Claim 93 is patentable over the patent granted to Gilbert et al.

Rejection under 35 U.S.C. §103(a) over the patent granted to Basceri et al. (U.S. Pat. No. 6,444,478).

Claim 86

Claim 86 is dependent on Claim 74 and is therefore allowable for the same reasons that Claim 74 is allowable. Furthermore, Claim 86 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 74, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 86 further specifies the additional limitation that the haze free PZT film is doped up to 5% with either La or Nb.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 74 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is doped up to 5% with either La or Nb. Moreover, Basceri et al. does not teach the preparation of a haze free PZT film - as advantageously claimed.

Therefore, Claim 86 is patentable over the patent granted to Basceri et al.

Claim 92

Claim 92 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 92 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 92 further specifies the additional limitation that the haze free PZT film is doped up to 5% with either La or Nb.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 75 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri

et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is doped up to 5% with either La or Nb. Moreover, Basceri et al. does not teach the preparation of a haze free PZT film - as advantageously claimed.

Therefore, Claim 92 is patentable over the patent granted to Basceri et al.

Claim 96

Claim 96 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 96 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patent granted to Basceri et al. Namely, Claim 96 further specifies the additional limitation that the haze free PZT film is doped up to 5% with either La or Nb.

Basceri et al. does not teach the advantageously claimed invention because Basceri et al. does not teach the use of the preheat step claimed in the Appellants' independent claim 76 (column 7 lines 56-59 and 64-67). Furthermore, because Basceri et al. does not teach a preheat step then Basceri et al does not teach the advantageously claimed haze free PZT film that is doped up to 5% with either La or Nb. Moreover, Basceri et al. does not teach the preparation of a haze free PZT film - as advantageously claimed.

Therefore, Claim 96 is patentable over the patent granted to Basceri et al.

**Rejection under 35 U.S.C. §103(a) over the patent granted to Gilbert et al.
(U.S. Pat. No. 6,730,354).**

Claim 83

Claim 83 is dependent on Claim 80 and is therefore allowable for the same reasons that Claims 74 and 80 are allowable. Furthermore, Claim 83 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claims 74 and 80, are not taught nor suggested by the patent granted to Gilbert et al. Namely, Claim 83 further specifies the additional limitation that Ar comprises at least 20% of the flow of said inert/oxidizer gas mixture in the preheat step.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of Ar in the preheat step (column 6 lines 54-60). The Appellants respectfully traverse the implication in the Office Action (page 7) that Gilbert et al. teaches the use of Ar in a preheat step. Rather, Gilbert et al. teaches a preheat step with no gases present (column 6 lines 54-60).

Moreover, the Appellants respectfully traverse the statement in the Office Action (page 7) "that Applicant does not teach that the Ar flow rate of at least 20% solves any stated problem or is for any particular purpose" and that "the flow rate lacks criticality in the claims invention and do not produce unexpected or novel results." The Appellants submit that they clearly state on page 5 (lines 15-17) that "[b]ecause of the preheat step that was performed in accordance with the invention hereinabove, a haze free, phase pure PZT film is now formed..." In addition, the Appellants clearly state on page 6 (lines 16-20): "By performing the preheat step in accordance with the present invention, the stoichiometric PZT from that forms the capacitor dielectric, 3, has desirable endurance, durability, and reliability. Furthermore, the haze free, phase pure PZT film, 3, formed using the preheat step of the present invention will operate at a lower operating voltage and therefore reduce the power consumption of the electronic device.

Therefore, Claim 83 is patentable over the patent granted to Gilbert et al.

Rejection under 35 U.S.C. §103(a) over the patent granted to Gilbert et al. (U.S. Pat. No. 6,730,354) in view of Sakurai (U.S. Pat. No. 6,350,644).

Claim 86

Claim 86 is dependent on Claim 74 and is therefore allowable for the same reasons that Claim 74 is allowable. Furthermore, Claim 86 is allowable on its own merits

because it recites additional features of the invention that, in combination with the limitations of Claim 74, are not taught nor suggested by the patents granted to Gilbert et al. and Sakurai; either alone or in combination. Namely, Claim 86 further specifies the additional limitation that the haze free PZT film is doped up to 5% with either La or Nb.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 74 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9) that is doped up to 5% with either La or Nb - as stated on page 8 of the Office Action (see also column 9 lines 1-46).

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). Sakurai's PZT film is not haze free because Sakurai's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed. Furthermore, it would not be logical to combine the teachings of Gilbert et al. with Sakurai (Office Action, page 8) because Sakurai's method does not include a preheat step (but Gilbert et al. does).

Moreover, the Appellants respectfully traverse the statement in the Office Action (page 8) that "Sakurai discloses the method wherein the PZT film is doped up to 5% with either La or Nb (see column 4, lines 10-20)". The Appellants submit that Nb is not

mentioned anywhere in column 5 lines 10-20. Similarly, doping up to 5% isn't mentioned anywhere in column 5 lines 10-20.

The Appellants respectfully traverse the statement in the Office Action (pages 8 and 14) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45)." The Appellants submit that in column 7 lines 40-45 Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Therefore, Claim 86 is patentable over the patents granted to Gilbert et al. and Sakurai.

Claim 92

Claim 92 is dependent on Claim 75 and is therefore allowable for the same reasons that Claim 75 is allowable. Furthermore, Claim 92 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 75, are not taught nor suggested by the patents granted to Gilbert et al. and Sakurai; either alone or in combination. Namely, Claim 92 further specifies the additional limitation that the haze free PZT film is doped up to 5% with either La or Nb.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 75 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9) that is doped up to 5% with either La or Nb - as stated on page 8 of the Office Action (see also column 9 lines 1-46).

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). Sakurai 's PZT film is not haze free because Sakurai 's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed. Furthermore, it would not be logical to combine the teachings of Gilbert et al. with Sakurai (Office Action, page 8) because Sakurai's method does not include a preheat step (but Gilbert et al. does).

Moreover, the Appellants respectfully traverse the statement in the Office Action (page 8) that "Sakurai discloses the method wherein the PZT film is doped up to 5% with either La or Nb (see column 4, lines 10-20)". The Appellants submit that Nb is not mentioned anywhere in column 5 lines 10-20. Similarly, doping up to 5% isn't mentioned anywhere in column 5 lines 10-20.

The Appellants respectfully traverse the statement in the Office Action (pages 8 and 14) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-

45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45).” The Appellants submit that in column 7 lines 40-45 Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Therefore, Claim 92 is patentable over the patents granted to Gilbert et al. and Sakurai.

Rejection under 35 U.S.C. §103(a) over the patent granted to Sakurai (U.S. Pat. No. 6,350,644) in view of Isobe et al. (U.S. Pat. No. 6,114,199).

Claim 76

Independent Claim 76 positively recites that the preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in a vacuum. These advantageously claimed features are not taught or suggested by the patents granted to Sakurai or Isobe et al.; either alone or in combination.

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). Sakurai's PZT film is not haze free because Sakurai's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed.

The Applicants respectfully traverse the statement in the Office Action (page 8) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45)." The Applicants submit that in column 7 lines 40-45 Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach the formation of a haze free PZT film. In addition, Isobe et al. (like Sakurai) does not teach the use of a preheating step as advantageously claimed (column 3 lines 49-61, column 5 lines 7-13). Therefore, combining Sakurai with Isobe et al. does not render obvious the advantageously claimed preheating step. In addition, it would not be logical to combine the teachings of Sakurai with Isobe et al. (which is suggested in the Office Action, page 9) because Isobe et al. does not teach the use of PZT as the capacitor dielectric. Combining the method of making a Bi-based layer-

structural perovskite type ferroelectric material (Isobe et al.) with a method of making a PZT-based ferroelectric material (Sakurai) is not logical.

Therefore, Claim 76 is patentable over the patents granted to Sakurai and Isobe et al.

Claim 95

Claim 95 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 95 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patents granted to Sakurai and Isobe et al.; either alone or in combination. Namely, Claim 95 further specifies the additional limitation that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). In addition, Sakurai does not teach the advantageously claimed invention because Sakurai does not teach that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 (column 6 lines 8-50). Sakurai's PZT film is not haze free because Sakurai's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed.

The Applicants respectfully traverse the statement in the Office Action (page 8) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45)." The Applicants submit that in column 7 lines 40-45 Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach that the haze free PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 (column 3 lines 38-48). In addition, Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach the formation of a haze free PZT film. Isobe et al. (like Sakurai) does not teach the use of a preheating step as advantageously claimed (column 3 lines 49-61, column 5 lines 7-13). Therefore, combining Sakurai with Isobe et al. does not render obvious the advantageously claimed preheating step. In addition, it would not be logical to combine the teachings of Sakurai with Isobe et al. (which is suggested in the Office Action, page 9) because Isobe et al. does not teach the use of PZT as the capacitor dielectric. Combining the method of making a Bi-based layer-structural perovskite type ferroelectric material (Isobe et al.) with a method of making a PZT-based ferroelectric material (Sakurai) is not logical.

Therefore, Claim 95 is patentable over the patents granted to Sakurai and Isobe et al.

Claim 96

Claim 96 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 96 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patents granted to Sakurai and Isobe et al.; either alone or in combination. Namely, Claim 96 further specifies the additional limitation that the haze free PZT film is doped up to 5% with either La or Nb.

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). Sakurai's PZT film is not haze free because Sakurai's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed.

The Applicants respectfully traverse the statement in the Office Action (page 8) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45)." The Applicants submit that in column 7 lines 40-45

Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Moreover, the Appellants respectfully traverse the statement in the Office Action (page 10) that Sakurai discloses a device wherein the PZT film is doped up to 5% with either La or Nb (column 4, lines 10-20). The Appellants submit that Nb is not mentioned anywhere in column 5 lines 10-20. In addition, doping up to 5% isn't mentioned anywhere in column 5 lines 10-20.

Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach that the haze free PZT film is doped up to 5% with either La or Nb (column 3 lines 38-48). Moreover, Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach the formation of a haze free PZT film. Isobe et al. (like Sakurai) does not teach the use of a preheating step as advantageously claimed (column 3 lines 49-61, column 5 lines 7-13). Therefore, combining Sakurai with Isobe et al. does not render obvious the advantageously claimed preheating step. In addition, it would not be logical to combine the teachings of Sakurai with Isobe et al. (which is suggested in the Office Action, page 9) because Isobe et al. does not teach the use of PZT as the capacitor dielectric. Combining the method of making a Bi-based layer-structural perovskite type ferroelectric material

(Isobe et al.) with a method of making a PZT-based ferroelectric material (Sakurai) is not logical.

Therefore, Claim 96 is patentable over the patents granted to Sakurai and Isobe et al.

Claim 97

Claim 97 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 97 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patents granted to Sakurai and Isobe et al.; either alone or in combination. Namely, Claim 97 further specifies the additional limitation that the haze free PZT film is PbZrO_3 .

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). In addition, Sakurai does not teach the advantageously claimed invention because Sakurai does not teach that the haze free PZT film is PbZrO_3 (column 6 lines 8-50). Sakurai's PZT film is not haze free because Sakurai's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed.

The Applicants respectfully traverse the statement in the Office Action (page 8) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45)." The Applicants submit that in column 7 lines 40-45 Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach that the haze free PZT film is PbZrO_3 . (column 3 lines 38-48). Moreover, Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach the formation of a haze free PZT film. Isobe et al. (like Sakurai) does not teach the use of a preheating step as advantageously claimed (column 3 lines 49-61, column 5 lines 7-13). Therefore, combining Sakurai with Isobe et al. does not render obvious the advantageously claimed preheating step. In addition, it would not be logical to combine the teachings of Sakurai with Isobe et al. (which is suggested in the Office Action, page 9) because Isobe et al. does not teach the use of PZT as the capacitor dielectric. Combining the method of making a Bi-based layer-structural perovskite type ferroelectric material (Isobe et al.) with a method of making a PZT-based ferroelectric material (Sakurai) is not logical.

Therefore, Claim 97 is patentable over the patents granted to Sakurai and Isobe et al.

Rejection under 35 U.S.C. §103(a) over the patent granted to Sakurai (U.S. Pat. No. 6,350,644) and Isobe et al. (U.S. Pat. No. 6,114,199) in view of Gilbert et al. (U.S. Pat. No. 6,730,354).

Claim 94

Claim 94 is dependent on Claim 76 and is therefore allowable for the same reasons that Claim 76 is allowable. Furthermore, Claim 94 is allowable on its own merits because it recites additional features of the invention that, in combination with the limitations of Claim 76, are not taught nor suggested by the patents granted to Sakurai, Isobe et al., or Gilbert et al.; either alone or in combination. Namely, Claim 94 further specifies the additional limitation that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$.

Sakurai does not teach the advantageously claimed invention because Sakurai does not teach the formation of a haze free PZT film (column 8 lines 3-12). Sakurai's PZT film is not haze free because Sakurai's fabrication process does not include a pre-deposition step of preheating the wafer (column 5 lines 39-44, column 7 lines 44-47), as advantageously claimed.

The Applicants respectfully traverse the statement in the Office Action (page 8) that Sakurai teaches "preheating said semiconductor wafer (column 7 lines 40-45), wherein said preheating step comprises heating said semiconductor wafer in a vacuum (see column 7 lines 40-45)." The Applicants submit that in column 7 lines 40-45 Sakurai describes the formation of the platinum bottom electrode, not a PZT film formed over the bottom electrode. Furthermore, no preheating step is discussed in that portion or any other portion of the Sakurai patent.

Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach that the haze free PZT film contains at least 2% excess Pb from the stoichiometric composition of $\text{Pb}_{1.0}(\text{Zr}, \text{Ti})_{1.0}\text{O}_3$ (column 3 lines 38-48). Moreover, Isobe et al. does not teach the advantageously claimed invention because Isobe et al. does not teach the formation of a haze free PZT film. Isobe et al. (like Sakurai) does not teach the use of a preheating step as advantageously claimed (column 3 lines 49-61, column 5 lines 7-13). Therefore, combining Sakurai with Isobe et al. does not render obvious the advantageously claimed preheating step. In addition, it would not be logical to combine the teachings of Sakurai and Gilbert et al. with Isobe et al. (which is suggested in the Office Action, page 10) because Isobe et al. does not teach the use of PZT as the capacitor dielectric. Combining the method of making a Bi-based layer-structural perovskite type ferroelectric material (Isobe et al.) with a method of making a PZT-based ferroelectric material (Sakurai and Gilbert et al.) is not logical.

Gilbert et al. does not teach the advantageously claimed invention because Gilbert et al. does not teach the use of the preheat step claimed in the Appellants' independent Claim 76 (column 6 lines 54-60). Furthermore, Gilbert et al does not teach the advantageously claimed haze free PZT film (column 8 lines 7-9).

Therefore, Claim 94 is patentable over the patents granted to Sakurai, Isobe et al., and Gilbert et al.

CONCLUSION

For the reasons stated above, the Appellants respectfully contend that each claim is patentable. Therefore, the reversal of all rejections is courteously solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Rose Alyssa Keagy", written in a cursive style.

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CLAIMS APPENDIX

74. A haze free PZT film prepared in accordance with the method comprising:

forming a front-end structure over a semiconductor substrate;

forming a bottom electrode over said front-end structure;

preheating said semiconductor wafer; and

forming a PZT film over said bottom electrode;

wherein said preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an ambient comprised of a mixture of an inert gas and an oxidizer gas.

75. A haze free PZT film prepared in accordance with the method comprising:

forming a front-end structure over a semiconductor substrate;

forming a bottom electrode over said front-end structure;

preheating said semiconductor wafer; and

forming a PZT film over said bottom electrode;

wherein said preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in an inert gas.

76. A haze free PZT film prepared in accordance with the method comprising:
forming a front-end structure;
forming a bottom electrode over said front-end structure;
preheating said semiconductor wafer; and
forming a PZT film over said bottom electrode;
wherein said preheating step comprises placing said semiconductor wafer on a heater, and heating said semiconductor wafer in a vacuum.

80. The haze free PZT film of Claim 74 wherein said inert gas is Ar.

81. The haze free PZT film of Claim 74 wherein said inert gas is N₂.

82. The haze free PZT film of Claim 74 wherein said oxidizer gas is O₂.

83. The haze free PZT film of Claim 80, wherein Ar comprises at least 20% of the flow of said inert/oxidizer gas mixture.

84. The haze free PZT film of Claim 74 wherein said PZT film contains at least 2% excess Pb from the stoichiometric composition of Pb_{1.0} (Zr, Ti)_{1.0}O₃.

85. The haze free PZT film of Claim 74 wherein said PZT film is a solid solution of the component end members PbZrO₃ and PbTiO₃.

86. The haze free PZT film of Claim 74 wherein said PZT film is doped up to 5% with either La or Nb.

87. The haze free PZT film of Claim 75 wherein said inert gas is Ar.

88. The haze free PZT film of Claim 75 wherein said inert gas is N₂.

89. The haze free PZT film of Claim 75 wherein said inert gas is He.

90. The haze free PZT film of Claim 75 wherein said PZT film contains at least 2% excess Pb from the stoichiometric composition of Pb_{1.0}(Zr,Ti)_{1.0}O₃.

91. The haze free PZT film of Claim 75 wherein said PZT film is a solid solution of the component end members PbZrO₃ and PbTiO₃.

92. The haze free PZT film of Claim 75 wherein said PZT film is doped up to 5% with either La or Nb.

93. The haze free PZT film of Claim 75 wherein said PZT film is PbZrO₃.

94. The haze free PZT film of Claim 76 wherein said PZT film contains at least 2% excess Pb from the stoichiometric composition of Pb_{1.0}(Zr,Ti)_{1.0}O₃.

95. The haze free PZT film of Claim 76 wherein said PZT film is a solid solution of the component end members PbZrO_3 and PbTiO_3 .

96. The haze free PZT film of Claim 76 wherein said PZT film is doped up to 5% with either La or Nb.

97. The haze free PZT film of Claim 76 wherein said PZT film is PbZrO_3 .

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None